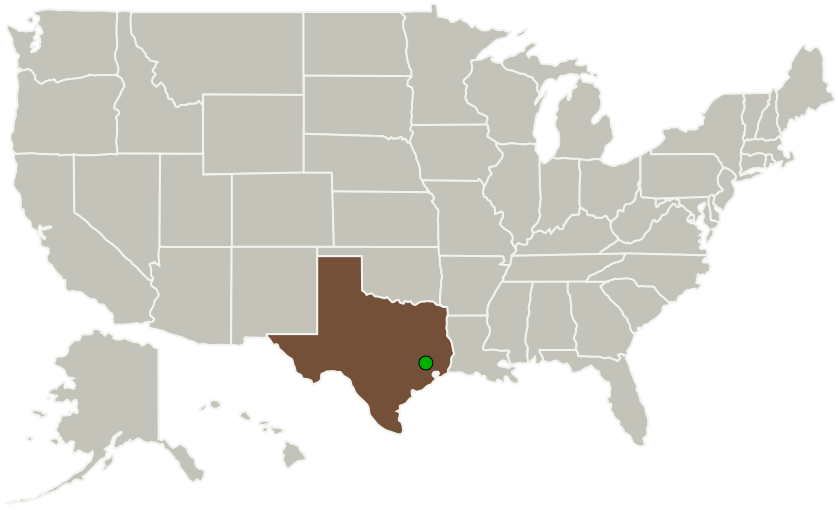
A Direct Methane Solid Oxide Fuel Cell (DMSOFC), Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Producing return fuel on Mars rather than carrying it from Earth significantly reduces the mass that must be lifted from Earth for a manned mission to Mars. The most practical propulsion combination that can be produced is methane and oxygen. Using propellant components made on Mars to generate electric power on the return voyage further reduces the mass that must be lifted. We are proposing to develop an energy conversion system to utilize the components of this propulsion combination to generate electricity for that voyage. The core of the system will be a direct methane oxygen solid oxide fuel cell (DMSOFC). To enhance conversion efficiency we will use the waste heat from the fuel cell stack to produce additional electricity before it is radiated away. (The combined efficiency of all stages of this system will exceed 70%.) Phase I will select an anode electrocatalyst, demonstrate a single cell fuel cell, select a heat re-covery system, and develop a design for the complete system, which will be built in Phase II.

Primary U.S. Work Locations and Key Partners



A Direct Methane Solid Oxide Fuel Cell (DMSOFC), Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

A Direct Methane Solid Oxide Fuel Cell (DMSOFC), Phase I

Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations
Texas

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137814)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Lynntech, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

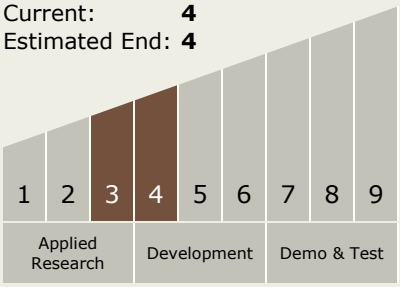
Carlos Torrez

Principal Investigator:

Alan Cisar

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



A Direct Methane Solid Oxide Fuel Cell (DMSOFC), Phase I

Completed Technology Project (2011 - 2011)

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System